



2012 International Conference on Applied Physics and Industrial Engineering A Tentative Study on the Evaluation of Community Health Service Quality*

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Abstract

Community health service is the key point of health reform in China. Based on pertinent studies, this paper constructed an indicator system for the community health service quality evaluation from such five perspectives as visible image, reliability, responsiveness, assurance and sympathy, according to service quality evaluation scale designed by Parasuraman, Zeithaml and Berry. A multilevel fuzzy synthetical evaluation model was constructed to evaluate community health service by fuzzy mathematics theory. The applicability and maneuverability of the evaluation indicator system and evaluation model were verified by empirical analysis.

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Keywords: community health service, service quality, evaluation indicator, evaluation model

1. Introduction

As health reform advances, community health service constitutions play an increasing distinct role. Community health service institutions can relieve effectively the hard situation of being difficult and expensive to receive medical treatment. Moreover, they can also take a part of patients away from large hospitals, promoting efficiency of those hospitals. Furthermore, they can also strengthen community functions by meeting basic health service needs of urban and suburban residents, improving life quality. During recent years, as the release of Several Opinions about Urban Community Health Service Development, Opinions About Urban Community Health Service Development Objects in 2005, Instructions and Standards of Community Health Service Center, and other related documents, many provinces and cities put forth policies about community service successively. Community health service quality is highly concerned by related government sectors and the society. Carrying out service quality evaluation to community health service institutions has great significance to ameliorate their serving functions and service quality.

These years, along with the reform of health care system and amelioration of community health service, researchers carried out many studies in the field of community health service. Through a systematic

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summarization of pertinent literature, it is found that most studies focus on community service performance while systematic quantitative studies on community service quality are scarce. Based on related studies, this paper designed an evaluation system to evaluate community health service institutions' service quality and corresponding questionnaire by improving service quality evaluation scale proposed by Parasuraman, Zeithaml and Berry in consideration of characteristics of community health service quality. This paper also evaluated the model by fuzzy comprehensive evaluation method. This study has great theoretical and practical significance.

2. Literature Review

Overseas researchers have done wide and profound researches on service quality. Parasuraman, A, Zeithaml, A and Berry (1985) held that service quality was more difficult to evaluate than goods quality; service quality was a result of comparison between actual feeling and expectation; service quality was simultaneously affected by service output and service process [1]. Kotler (1993) held that service quality was a concept relative to customer expectation; in order to get customers' approval, service provided should be better than that expected by customers [2]. Jing-lun Han (2006) carried out an empirical study on China's service business based on their systematic introduction of current overseas studies about service quality [3]. Yun-yan Gao (2007) pointed out that evaluation of the corporation service quality directly depended on customer satisfaction degree and constructed a service quality evaluation model to evaluate service quality with an uncertain customer satisfaction degree [4].

Issues about community health service are also studied. Bing Cao (2004) pointed out in their research that community health service was still at its initial stage due to insufficient input by government and inadequate awareness of leaders at all levels; at the same time the fact that professional quality and expertise of health care staffs were at a low level and that staff stability was poor impacted the development of community health institutions [5]. Wei Liu, et al. (2004) carried out an investigation in a community health service centre in Jiang Su province for its operation conditions, finding that structure of health care staff was unreasonable, that service content was monotonous, that bi-directional medical treatment system was not mature, and that management methods and service model was outdated [6]. Shi-xue Li, et al. (2006) analyzed serving functions and operation mechanism of urban community health service institutions, providing a systematic summarization of causes producing problems and detailed amelioration measures [7]. Sheng-guo Jin (2007) pointed out that uneven development of community health service centre in the urban and in the suburban turned into a serious problem and discrepancy also existed among different regions [8]. Li Zhang (2010) constructed a core indicator system for community nursing quality evaluation, providing a basis to evaluate the overall service quality of community health service [9]. Jing Yang, et al. (2010) constructed an indicator system to carry out overall evaluation for community health service institutions, using Delphi expert consultation method combined with current community health service development conditions [10].

Studies on community health service are mainly qualitative studies. Quantitative studies on service quality are scarce. This paper constructed a scientific service quality evaluation system, providing a basis to improve service quality of community health service institutions.

3. Construction of Evaluation System for Community Health Service Quality

Based on the service quality evaluation scale designed by Parasuraman, Zeithaml and Berry[11], this paper evaluates service quality of community health service communities from such five perspectives as visible image, reliability, responsiveness, assurance and sympathy. Visible image denotes hardware equipments owned by the community health service constitution and external image of staff working in the constitution. Reliability means that competence and skills of the service staff is trusted by customers. Responsiveness refers to service attitude and service efficiency of the staff. Assurance means that service and etiquette presented by the staff can obtain customers' trust. Sympathy means that the staff is able to understand

customers' personal conditions and mood, offering personalized care. The evaluation index system constructed is as below:

TABLE I. EVALUATION INDEX SYSTEM OF COMMUNITY HEALTH SERVICE QUALITY

Community Health Service Quality Evaluation System U							
Primary Index		Secondary Index		Primary Index		Secondary Index	
Visible image	U_1	Be equipped with advanced medical equipments	u_{11}	Responsiveness	U_3	Human-oriented service principle	u_{31}
		The circumstance is clean and facilities are placed in order	u_{12}			The staff is enthusiastic and friendly during the process of providing service	u_{32}
		All kinds of signs are clear	u_{13}			Advise patients of time to provide service accurately	u_{33}
		The health care staffs are neatly and appropriately dressed	u_{14}			Provide service to patients timely	u_{34}
Reliability	U_2	The health care staffs are equipped with required professional qualification	u_{21}	Assurance	U_4	Service provided can bring confidence to patients	u_{41}
		Promised services can be provided within specified time	u_{22}			Patients feel secure when they are receiving service	u_{42}
		Patients' problems can be settled effectively	u_{23}			Be able to provide proper service to patients	u_{43}
		Reliable services can be provided to patients	u_{24}			Be able to answer patients' questions from professional view	u_{44}
Sympathy	U_5	Provide patients with special care					u_{51}
		Working time schedule is convenient for patients					u_{52}
		Keep patients' medical records confidential					u_{53}
		Arrange regular return visits for patients, if needed					u_{54}
		Be able to provide personalized service for patients					u_{55}

4. Multilevel Fuzzy Comprehensive Evaluation Model

Considering the fuzziness of community health service quality evaluation indicators, service quality will be evaluated by fuzzy comprehensive evaluation, whose basic procedures are as follows [12-14]:

4.1 Establish Factor Set

Factor set is a set consisting of all factors of the evaluation target. Suppose factor set $U = \{u_1, u_2, \dots, u_m\}$. Subdivide each factor u_i into several sub-factor u_{ij} , forming into a sub-factor set: $u_i = \{u_{i1}, u_{i2}, \dots, u_{in}\}$; wherein, u_{ij} is the j^{th} level sub-factor of the factor i ($i = 1, 2, \dots, m$; $j = 1, 2, \dots, n$, there in after).

4.2 Establish Evaluation Set

Suppose that evaluation will have p possible results in total. Then the evaluation set can be expressed as $V = \{v_1, v_2, \dots, v_p\}$; wherein, v_k is the k^{th} possible evaluation result ($k = 1, 2, \dots, p$, there in after).

4.3 Establish Weight Set

1) *Level weight set*. Determine weight a_{ij} for each level according to subjection degree of each level u_{ij} to factor u_i ; level weight set is obtained as: $A_i = (a_{i1}, a_{i2}, \dots, a_{in})$; wherein,

$$\sum_{i=1}^m \sum_{j=1}^n a_{ij} = 1.$$

2) *Factor weight set*. Grant corresponding weight a_i to each factor u_i according to its importance degree. Factor weight set is obtained as: $A = (a_1, a_2, \dots, a_m)$; Wherein,

$$\sum_{i=1}^m a_i = 1.$$

4.4 First-level Fuzzy Comprehensive Evaluation

First-level fuzzy comprehensive evaluation means carrying out comprehensive evaluation from each level of the factor. Suppose to evaluate the evaluation target from the j^{th} level u_{ij} of the i^{th} factor. If subjection degree of the evaluation target to the k^{th} factor in the evaluation set is r_{ijk} , then level evaluation matrix of the i^{th} factor is $R_i = (r_{ijk})_{n \times p}$. Therefore the level one fuzzy comprehensive evaluation set is:

$$B_i = A_i \cdot R_i = (b_{i1}, b_{i2}, \dots, b_{ip}); \quad (1)$$

Wherein, b_{ik} denotes subjection degree of the evaluation target to the k^{th} factor in the evaluation set during comprehensive evaluation from each level of the i^{th} factor.

4.5 Second-level Fuzzy Comprehensive Evaluation

Second-level fuzzy comprehensive evaluation means that comprehensive evaluation is carried out from all factors, in which the single factor evaluation should be an level one fuzzy comprehensive evaluation. According to the above section, single factor evaluation matrix is $R = B_i = (r_{ik})_{m \times p}$; wherein, $r_{ik} = b_{ik}$.

Therefore, the level two fuzzy comprehensive evaluation set is:

$$B = A \cdot R = (b_1, b_2, \dots, b_p) \quad (2)$$

Wherein, b_k denotes subjection degree of the evaluation target to the k^{th} factor in the evaluation set during comprehensive evaluation from all factors.

If some sub-factor set u_i still consists of too many factors, u_i can be subdivided again to form into a level three evaluation model. The evaluation will start from the lowest level factors produced in the last subdivision, and go to the upper level factors until to the highest level.

5. Empirical Analysis

As the evaluation target is community health service quality, this study chose a community health service center in Zhenjiang city, Jiangsu province as the research object and 20 patients who has been to this health center to receive medical treatment as evaluation staffs. Health service quality of that health center will be evaluated by the said evaluation indicator system and model.

5.1 Determination of Evaluation Indicator Weight

In order to identify the relative importance degree among evaluation indicators, the researcher consulted some experts in college and in the field of community health service quality evaluation for opinions and suggestions, based on which the improved AHP method [15] was applied to obtain factor weight set for each level: $A = (0.20, 0.26, 0.17, 0.23, 0.14)$, $A_1 = (0.13, 0.21, 0.38, 0.28)$, $A_2 = (0.21, 0.37, 0.226, 0.16)$, $A_3 = (0.29, 0.14, 0.36, 0.21)$, $A_4 = (0.21, 0.28, 0.13, 0.38)$, $A_5 = (0.20, 0.24, 0.28, 0.16, 0.12)$.

5.2 The Process of Fuzzy Comprehensive Evaluation

The evaluation target is community health service quality. Assume evaluation set $V = \{v_1, v_2, v_3, v_4, v_5\} = \{\text{excellent, good, average, poor, very poor}\}$, reflecting different conditions of community health service quality and its performance on evaluation indicators. Evaluation and rating were carried out by the evaluation team. Suppose that evaluation personnel identify one indicator of the single factor layer with

factors in the evaluation set for the number of times $N = \{n_1, n_2, n_3, n_4, n_5\}$; wherein $\sum_{i=1}^5 n_i = 20$. Then subjection degree of the indicator to each factor in the evaluation set can be obtained by $n_i/20$. Subjection degree of other indicators can be obtained in the similar way. See table II for results.

TABLE II. DATA OF EVALUATION INDICATORS

Evaluation Indicators	v_1	v_2	v_3	v_4	v_5
u_{11}	0.0	0.1	0.5	0.4	0.0
u_{12}	0.05	0.4	0.45	0.1	0.0
u_{13}	0.0	0.6	0.35	0.05	0.0
u_{14}	0.25	0.3	0.4	0.05	0.0
u_{21}	0.05	0.5	0.45	0.0	0.0
u_{22}	0.1	0.6	0.3	0.0	0.0
u_{23}	0.05	0.55	0.4	0.0	0.0
u_{24}	0.1	0.5	0.25	0.15	0.0
u_{31}	0.0	0.5	0.35	0.15	0.0
u_{32}	0.05	0.45	0.45	0.05	0.0
u_{33}	0.0	0.55	0.3	0.15	0.0
u_{34}	0.05	0.55	0.3	0.1	0.0
u_{41}	0.05	0.5	0.35	0.1	0.0
u_{42}	0.0	0.6	0.25	0.1	0.05
u_{43}	0.15	0.45	0.3	0.1	0.0
u_{44}	0.1	0.3	0.55	0.05	0.0
u_{51}	0.0	0.2	0.45	0.3	0.05
u_{52}	0.0	0.4	0.35	0.15	0.1
u_{53}	0.0	0.7	0.25	0.05	0.0
u_{54}	0.0	0.15	0.2	0.35	0.3
u_{55}	0.0	0.1	0.35	0.35	0.2

3) First-level fuzzy comprehensive evaluation

Apply model $M(\cdot, +)$ to carry out the calculation:

$$B_1 = A_1 \cdot R_1 = (0.13, 0.21, 0.38, 0.28) \cdot \begin{bmatrix} 0.0 & 0.1 & 0.5 & 0.4 & 0.0 \\ 0.05 & 0.4 & 0.45 & 0.1 & 0.0 \\ 0.0 & 0.6 & 0.35 & 0.05 & 0.0 \\ 0.25 & 0.3 & 0.4 & 0.05 & 0.0 \end{bmatrix}$$

$$= (0.081, 0.409, 0.405, 0.105, 0.000)$$

Other evaluation sets can be obtained in the same way: $B_2 = (0.077, 0.550, 0.349, 0.024, 0.000)$; $B_3 = (0.018, 0.522, 0.335, 0.125, 0.000)$; $B_4 = (0.068, 0.446, 0.391, 0.081, 0.014)$; $B_5 = (0.000, 0.368, 0.318, 0.208, 0.106)$.

4) Second-level fuzzy comprehensive evaluation

The single factor evaluation during the level two fuzzy comprehensive evaluation shall be the corresponding level one fuzzy comprehensive evaluation. Apply model $M(\cdot, +)$ to carry out the calculation:

$$B = A \cdot R = (0.20, 0.26, 0.17, 0.23, 0.14) \cdot$$

$$\begin{bmatrix} 0.081 & 0.409 & 0.405 & 0.105 & 0.000 \\ 0.077 & 0.550 & 0.349 & 0.024 & 0.000 \\ 0.018 & 0.522 & 0.335 & 0.125 & 0.000 \\ 0.068 & 0.446 & 0.391 & 0.081 & 0.014 \\ 0.000 & 0.368 & 0.318 & 0.208 & 0.106 \end{bmatrix}$$

$$= (0.055, 0.468, 0.363, 0.096, 0.018)$$

Wherein, B is comprehensive evaluation results of health service quality provided by the studied health center. Quantize factors in the evaluation set V . Assuming $v_1=5$, $v_2=4$, $v_3=3$, $v_4=2$, $v_5=1$, then $V= \{5, 4, 3, 2, 1\}$. Value obtained from weighted processing of the above evaluation result:

$V=0.055 \times 5 + 0.468 \times 4 + 0.363 \times 3 + 0.096 \times 2 + 0.018 \times 1 = 3.446$. Since $3 < V < 4$, health service quality of the community health service centre should be at the level of “better than average”.

It can be found from Table II that most evaluation personnel rated each indicator between “average” and “good”, indicating that health service of the community health service center had many deficiencies. For example, from the perspective of visible image, the biggest problem is laggard conditions of medical equipments. From the perspective of reliability, though the health care staffs are generally equipped with required professional qualification, the performance of solving patients’ problem and quality of health service provided fail to win most patients’ trust. From the perspective of responsiveness, high uncertainty of the time of receiving service is the factor causing most complaints, indicating an urgent need to raise service efficiency of the community health service center. From the perspective of assurance, professionalism of health care staffs is to be improved in a further way. From the perspective of sympathy, rule about regular return visits to patients isn’t followed strictly.

6. Conclusion and Suggestions

Through the above theoretical study and empirical analysis, this paper draws the following conclusions and proposes the below suggestions:

5) The empirical analysis shows that the evaluation indicator system for community health service quality constructed in this paper has high applicability and maneuverability. The multilevel fuzzy comprehensive evaluation model constructed based on fuzzy mathematics theory is able to handle fuzziness of evaluation data well, which makes evaluation results more objective and reliable.

6) Government should increase economic input to community health service institutions, and ameliorate construction of hardware, namely, medical equipments. Community health service institutions should strengthen general medical education for health care staffs, improving their professional quality and professionalism, in order to solve patients’ problems effectively. Moreover, encourage middle and high level or retired health care staffs to take part in community health service, in order to improve professionalism of the institution and patients’ satisfaction to health service provided.

7) The community should strengthen health knowledge publicity and community health education for residents to elevate their command of health knowledge and intrigue their awareness of prevention and health care, which can not only motivate residents’ initiative to participate in community health service, but also can promote residents’ needs for community health service.

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